550429

FLOOD INSURANCE STUDY

VILLAGE OF RANDOM LAKE, WISCONSIN

SHEBOYGAN COUNTY

OCTOBER 1, 1980

federal emergency management agency
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FLOOD INSURANCE STUDY

VILLAGE OF RANDOM LAKE,
SHEBOYGAN COUNTY, WISCONSIN

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Random Lake, Sheboygan County, Wisconsin, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Village of Random Lake to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (c). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Donohue & Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4726. This study was completed in May 1979.

1.3 Coordination

An initial coordination meeting was held on March 15, 1978, to explain study procedures and to determine detailed and approximate study areas. This meeting was attended by representatives of the Village of Random Lake, the FIA, the Wisconsin Department of Natural Resources, and the Study Contractor.

Information pertinent to this Flood Insurance Study was coordinated with the following agencies and individuals: village officials and local residents; The Sheboygan Press; the Random Lake Sounder; the Sheboygan County Historical Society; the U.S. Army Corps of Engineers (COE), Chicago District; the U.S. Geological Survey (USGS), Water Resources Division; the U.S. Department of Agriculture, Soil Conservation Service (SCS); the Wisconsin Department of Natural Resources; Owen Ayres & Associates; Howard, Needles, Tammen & Bergendoff; and Carl C. Crane, Inc.

On May 1, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting Village of Random Lake.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the entire incorporated area of the Village of Random Lake. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through May 1984.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the Village of Random Lake.

The flooding sources studied by detailed methods are listed below:

a. Random Lake within the corporate limits; and

b. Silver Creek from Random Lake to the corporate limits.

A wetland area in the southwest corner of the village west of County Highway K, and a portion of Silver Creek, downstream of Random Lake, that passes through the northwest corner of the community were studied by approximate methods.

2.2 Community Description

The Village of Random Lake is located in south-central Sheboygan County, approximately 35 miles north of Milwaukee and 18 miles southwest of Sheboygan. Completely surrounded by the unincorporated areas of Sheboygan County, Random Lake is a small residential, commercial, and industrial center serving southern Sheboygan County. According to the 1970 Census, the population of Random Lake was 1,068.

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FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF RANDOM LAKE, WI
(SHEBOYGAN CO.)

APPROXIMATE SCALE
4 0 4 8 12 MILES

VICINITY MAP

The first settlers arrived in Random Lake in 1848. The first commercial establishments were a lumber yard and a hotel. The village was platted in 1872, and the Milwaukee and Northern Railroad provided service to the area shortly thereafter. The village grew and prospered around the railroad. Random Lake was officially incorporated in 1907 (Reference 1).

The climate in Random Lake is continental, with cold, snowy winters and warm, humid summers. The average temperatures for January and July are 20 degrees Fahrenheit (F.) and 71 degrees F., respectively. Average rainfall is about 30 inches per year and snowfall averages about 45 inches per year (Reference 2).

The major soil associations in the Random Lake area are the Hochheim-Theresa: deep, well-drained, loamy soils; and the Kewaunee-Waymor-Manawa: deep, fairly well-drained, clayey or loamy soils (Reference 2). The topography of the Random Lake area is influenced from the west by the interlobate moraine extending almost continuously from Door County southwest to Walworth County and from the east by the gently rolling till plain leading to Lake Michigan. The physiology and distribution of soils are mainly the results of glacial action which buried the underlying dolomite bedrock. As the glaciers retreated, they left a mass of loamy material from which the Hochheim, Theresa, and associated soils were formed. Land uses along the flood plain in Random Lake include residential, commercial, and open space.

2.3 Principal Flood Problems

There is no record of a major flood in the history of the village. Local residents have indicated that Random Lake may rise a few inches after a heavy rain, but this condition subsides within a few hours. Inundation on lake front properties has not been known to extend horizontally more than 5 to 10 feet. A low region located west of County Highway K, studied by approximate methods, may become saturated during a heavy rain, but will not remain covered by standing water. County Highway H, located on the northern perimeter of the area, requires seasonal repairs due to the unstable subsoils.

2.4 Flood Protection Measures

A dam at the outlet of Random Lake serves a twofold purpose. Its primary function is to keep unwanted fish out of the lake, which has been poisoned and restocked with game fish. It is also used to maintain the elevation of the lake and could be used to control the lake level in the event of high water problems. Random Lake is currently restricting flood plain development through zoning ordinances.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required

for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Peak discharges for Random Lake and Silver Creek were determined by methods described in a Milwaukee River watershed report prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) (Reference 3). The hydrologic analysis for Random Lake and Silver Creek to establish the peak discharge relationship for floods of the 10-, 50-, and 100-year recurrence intervals was made utilizing the SCS hydrology computer program TR-20 (Reference 4). The principal factors considered in this method are soil types, land uses, slope of terrain, general channel slope and shape, and rainfall distribution. The 500-year discharges were calculated using a straight-line projection on log-probability paper. The discharges in the report are based on 1990 land uses, which, for the Random Lake area, would not be significantly different than existing land uses.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SILVER CREEK					
At Private Drive	1.18	175	230	255	310
RANDOM LAKE					
Outlet at State Highway 144	3.73	85	110	120	140

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Analysis for Random Lake and Silver Creek is described in the Milwaukee River watershed study prepared by the SEWRPC (Reference 3). Starting water-surface elevations for Silver Creek were based on the elevations of Random Lake. Water-surface elevations on Silver Creek of floods of the selected recurrence intervals were computed through the use of the COE computer program 22-J2-L212, Backwater-Any Cross Section (Reference 5). The effects of various hydraulic structures and stream conditions were considered in the computations. Elevations for Random Lake were based on the calculated stage-discharge relationship for the outlet structure of the lake. For the 500-year flood, the backwater from the lake extends upstream along Silver Creek to the corporate limit. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. This analysis does not include the contribution from wave crest height and wave runup. Nonetheless, this additional hazard due to wave action effect should be considered in planning future development.

For the area studied using approximate methods along the southern corporate limit, the flooding limits from a 100-year, 24-hour storm were calculated. These limits were found to compare quite closely with the limits of swamp area shown on both USGS maps (Reference 6) and SCS Soil Survey Maps (Reference 2). For the portion of Silver Creek in the northwest corner of the community, the approximate 100-year flooding limits were determined from the Flood Hazard Boundary Map (Reference 7) and the SEWRPC report (Reference 3).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using topographic maps at a scale of 1:2400, with a contour interval of four feet (Reference 8). Approximate flood boundaries were delineated on the same topographic maps.

Flood boundaries are indicated on the Flood Insurance Rate Map (Panel 0001). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards Zones A, A1, and A3); and the 500-year flood boundary corresponds to the boundary of areas of moderate flood hazards (Zone B). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management.

Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. However, the Wisconsin Department of Natural Resources has established a policy that limits encroachment in the flood plain to 0.1 foot (Reference 9).

Due to the relatively short reach of Silver Creek and the lack of effective conveyance within Random Lake, floodways have not been computed for this study per FIA concurrence.

In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

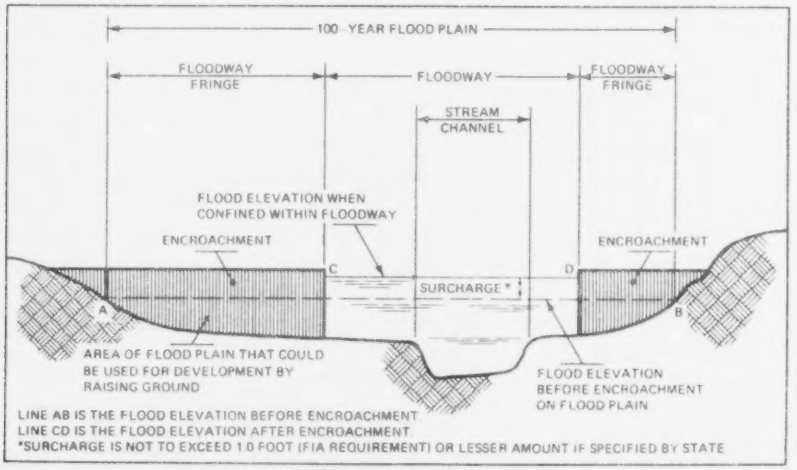
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the Village of Random Lake.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the Village of Random Lake are shown on the Flood Profiles and are summarized in the Flood Insurance Zone Data Table (Table 2).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Village of Random Lake was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.

Zones A1, A3:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 2, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Random Lake is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Insurance Study conducted by the FIA for the unincorporated areas of Sheboygan County agrees with this study (Reference 10). The SEWRPC published a report, A Comprehensive Plan for the Milwaukee River Watershed (Reference 3), which was used as the basis for the hydrologic and hydraulic information in this report. The SEWRPC has reviewed and concurred with the hydrologic and hydraulic information contained within this report.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 7). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
RANDOM LAKE–SILVER CREEK							
REACH 1	0001	–1.3	–0.5	1.2	015	A3	VARIES–SEE MAP
REACH 2	0001	–0.2	–0.1	0.3	005	A1	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
VILLAGE OF RANDOM LAKE, WI
(SHEBOYGAN CO.)

FLOOD INSURANCE ZONE DATA

RANDOM LAKE - SILVER CREEK

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

8.0 REFERENCES AND BIBLIOGRAPHY

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2. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Sheboygan County, Wisconsin, January 1978.

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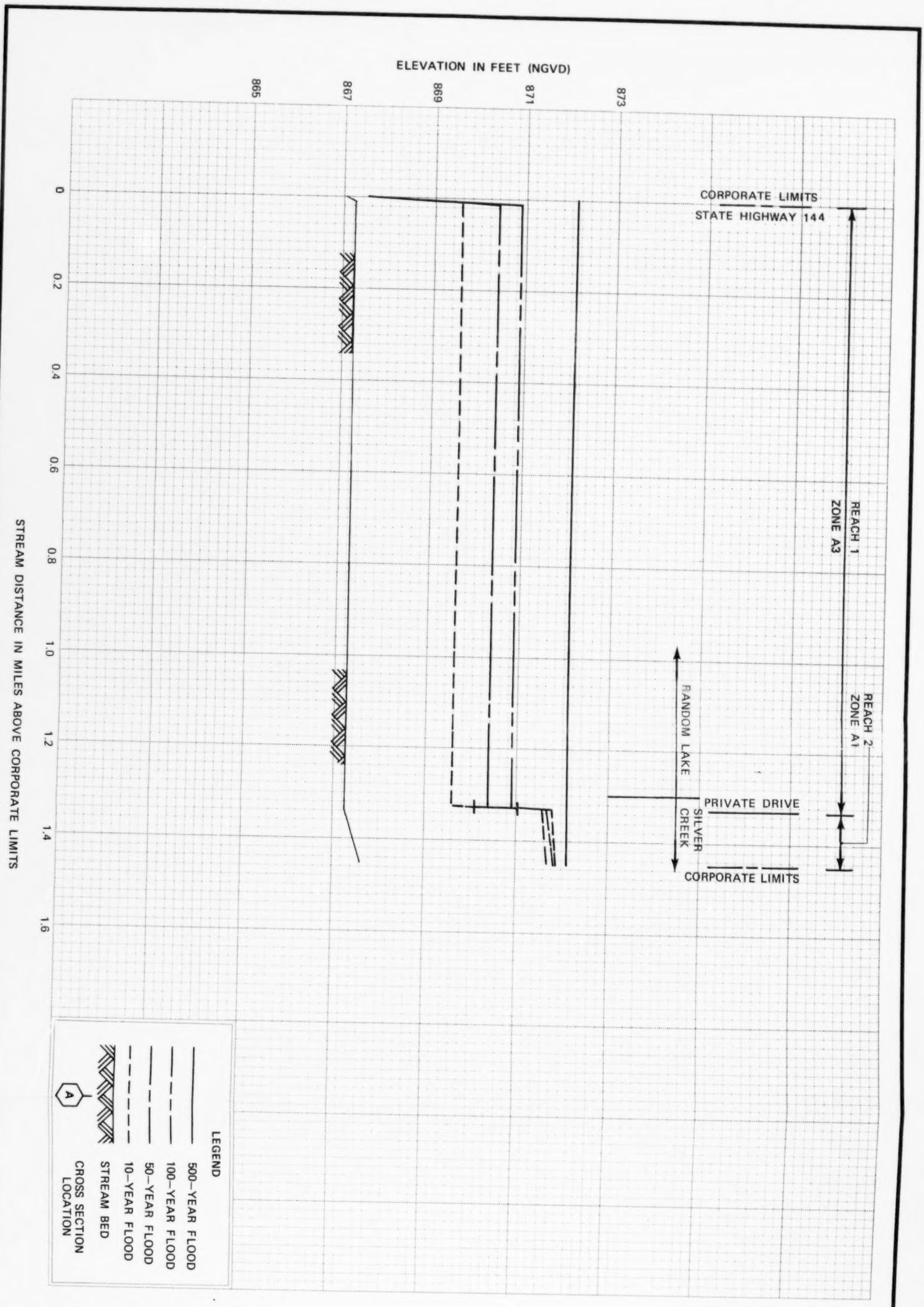
6. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 feet: Sheboygan Falls, Wisconsin, 1954.

7. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Random Lake, Wisconsin, August 1977.

8. Southeastern Wisconsin Regional Planning Commission, Topographic Maps, Scale 1:2400, Contour Interval four feet: Village of Random Lake, Wisconsin, 1975, (revised) 1978.

9. Wisconsin Department of Natural Resources, Wisconsin's Flood Plain Management Program, Chapter NR 116, Register No. 259, 1977.

10. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Sheboygan County, Wisconsin, July 1978.



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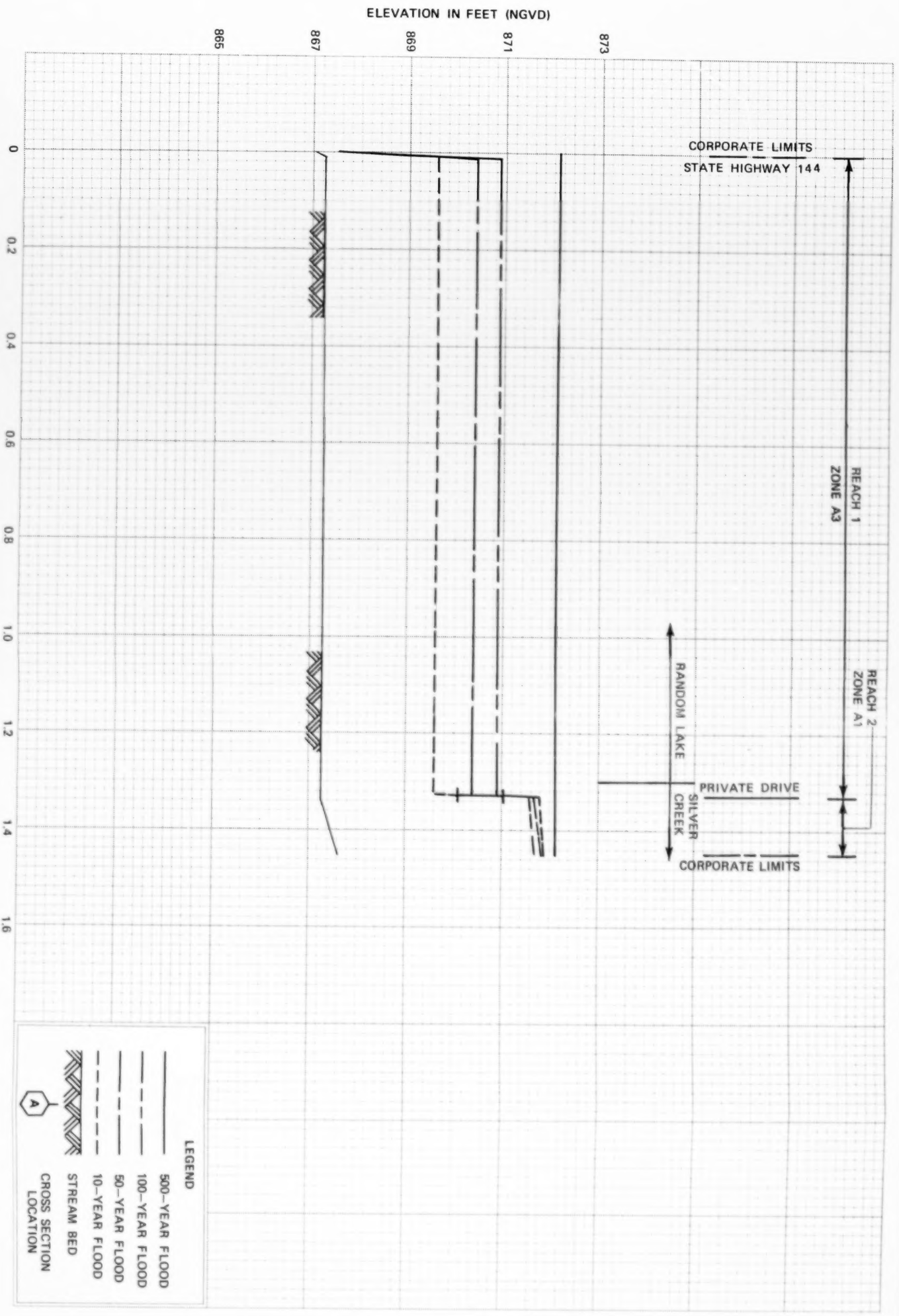
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF RANDOM LAKE, WI
(SHEBOYGAN CO.)

FLOOD PROFILES

RANDOM LAKE - SILVER CREEK



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **VILLAGE OF RANDOM LAKE, WI** (SHEBOYGAN CO.)	**FLOOD PROFILES** **RANDOM LAKE - SILVER CREEK**